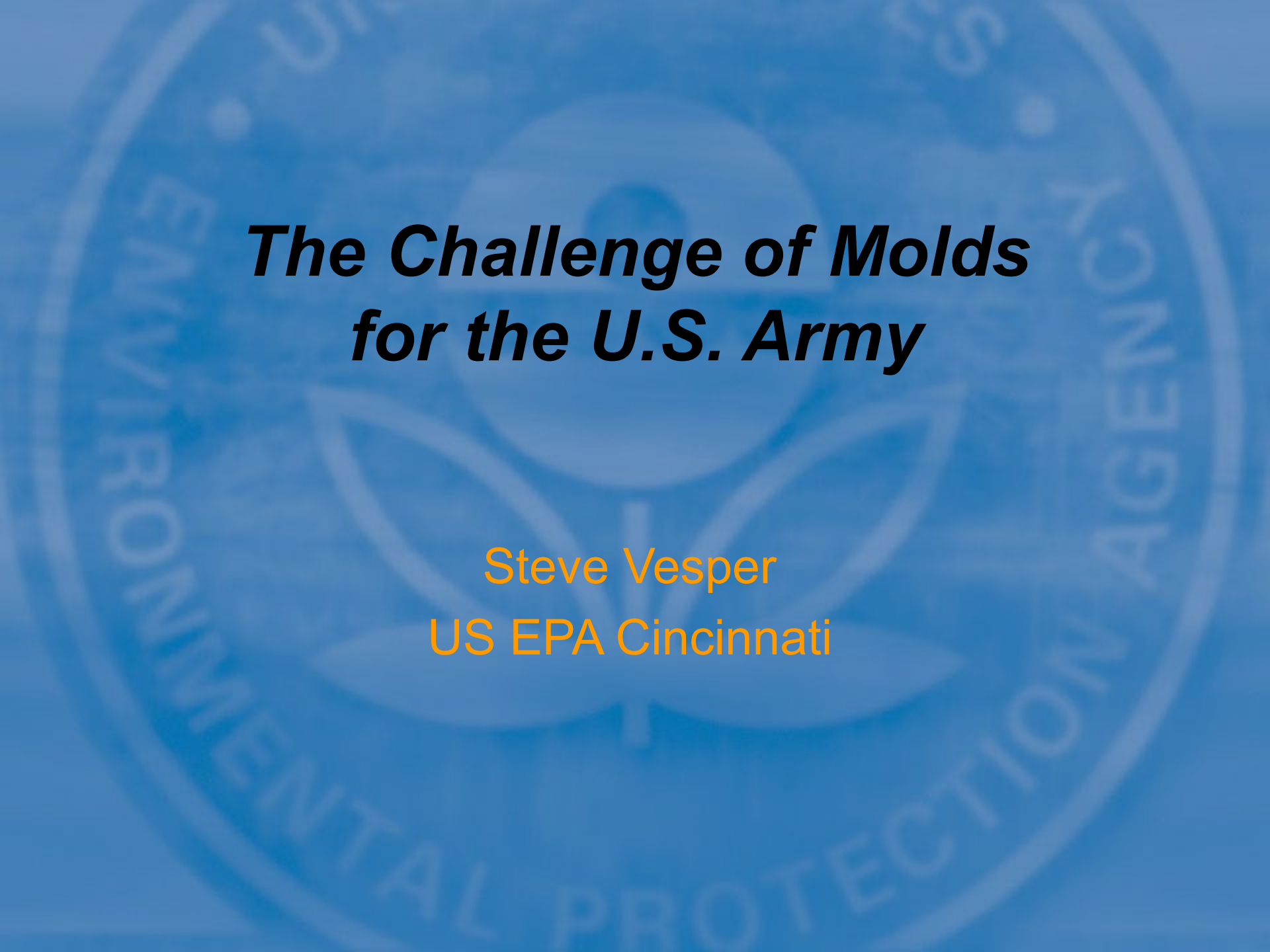




The Challenge of Molds for the U.S. Army

Steve Vesper
US EPA Cincinnati

Trench Foot

Trench Foot results from prolonged exposure of the feet to wetness and cold at temperatures from just above freezing to 10 degrees C.

Trench Foot is usually associated with long periods of standing or keeping the feet still.

Signs & Symptoms | First Aid Treatment



Signs & Symptoms

These may vary from case to case and some people will show no signs.

The following are the normal signs and symptoms of trench foot:

- An uncomfortable feeling of numbness in the feet developing over 7-10 days
- Feet may be cold, heavy and painful
- Toes and ankles are stiff and walking is difficult
- Prickly or tingling sensations
- Swelling in the affected area

First Aid Treatment for Trench Foot

Step 1 Warm the affected area in a bath (about 37 degrees C) to relieve pain

Step 2 Dry the affected area thoroughly and keep it clean

Step 3 Elevate the feet to reduce swelling

Step 4 Keep the patient warm so the feet have a generous supply of blood

Warning





- ▶ 508-Compliant Site
- ▶ Clinicians
- ▶ Veterans
- ▶ Reserve Component
- ▶ Deployment Cycle Support
- ▶ PDH Guidelines
- ▶ Emerging Health Concerns
- ▶ News and Announcements
- ▶ Library
- ▶ Education and Training

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Deployments

Operation Allied Force

BACKGROUND	RELATED LINKS	IN THE NEWS	DEPLOYMENTS
HEALTH OUTCOMES & CONCERNS	CLIMATE & GEOGRAPHY	PREVENTIVE MEASURES	ENVIRONMENTAL EXPOSURES

Environmental Exposures:
Food Contamination

Recent epidemiologic studies indicate the presence of Ochratoxin A in locally grown crops. Ochratoxin A is a natural contaminant of many food and feed found primarily in cereals.



In the News



RESEARCH & DEVELOPMENT

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ASSAY OF CELLULOLYTIC ACTIVITY OF MOLDS ISOLATED FROM FABRICS AND RELATED ITEMS EXPOSED IN THE TROPICS *

W. LAWRENCE WHITE, RICHARD T. DARBY, GLADYS M. STECHERT,
KATHRYN SANDERSON

(WITH 3 FIGURES)

TABLE 11 continued

Species	Culture Number	Source	Locality	Method Variant	Per Cent Strength Retained				Growth at End of Experiment
					6 Days	9 Days	12 Days	15 Days	
<i>F. oxysporum</i> Schl. (cont.)	PQMD 23e	Rope	Russell Is.	1	49	51	40		3
<i>F. oxysporum</i> Schl.	PQMD 23h	Rope	Russell Is.	1	54	49	38		1
<i>F. oxysporum</i> Schl.	PQMD 47e	Wax paper	Ledo, India	2	67	56	51		1
<i>F. oxysporum</i> Schl.	Fla B-61	Tent	Florida	3	39	27	19		4
<i>F. oxysporum</i> Schl.	Fla B-63	Tent	Florida	3	41	29	22		4
<i>F. oxysporum</i> Schl.	Fla C-8	Web belt	Florida	3	49	36	30		3
<i>F. roseum</i> Link	PQMD 38a	Tent	Karachi, India	2	93	77	66		2
<i>F. roseum</i> Link	PQMD 38e	Tent	Karachi, India	2	101	95	98		0
<i>F. roseum</i> Link	PQMD 38h	Tent	Karachi, India	2	103	95	90		0
<i>F. roseum</i> Link	PQMD 38g	Tent	Karachi, India	2	106	95	103		0
<i>F. roseum</i> Link	PQMD 40a	Canvas	Karachi, India	2	87	66	59		3
<i>F. roseum</i> Link	PQMD 125c	Canvas	Karachi, India	3	91	87	81		0
<i>F. roseum</i> Link	Fla A-17		Florida	1		76	53	49	4
<i>F. roseum</i> Link	Fla B-15	Tent	Florida	3	83	71	65		3
<i>F. roseum</i> Link	Fla B-24	Canteen cover	Florida	3	70	54	44		3
<i>F. Scirpi</i> var. <i>longipes</i> (W. & R.) W.	PQMD 23g	Rope	Russell Is.	1	58	53	38		2
<i>F. Scirpi</i> var. <i>longipes</i> (W. & R.) W.	PQMD 50f	Rope	Hawaii	2	101	101	102		0
<i>F. semitectum</i> Berk. & Rav.	PQMD 66b	Web strap	Finsch., N.G.	2	78	71	54		2
<i>F. semitectum</i> Berk. & Rav.	PQMD 122a	Duck	Panama	3	73	64	56		2
<i>F. semitectum</i> var. <i>majus</i> (Berk. & Lan.) Woll.	PQMD 121c	Tarpaulin	Panama	3		85	74		1
<i>F. Solani</i> (Mar.) Appel & Woll.	PQMD 21d	Tarpaulin	Espiritu Santo Is.	1	92	71	56		1

WHITE, DARBY, STECHERT, SANDERSON: MOLDS

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China's Terracotta Army Gets Dose of Modern Medicine

After surviving 2,200 years underground, China's famed terracotta army is now being attacked by more than 40 varieties of mold, perhaps it's most formidable enemy ever.



View of army at Xian

Officials find mold in Army Community Housing

By Lt. Col. Bryan Hilferty and PAO staff reports
Public Affairs Office

PHILADELPHIA – A Fort Drum community housing unit here is undergoing repairs after significant mold growth was found in the home, post officials said.

Officer Threatens Army Wife: She Complained About Bad Housing That Made Kids Sick

June 28, 2004 By Karen Jowers, Army Times staff writer

Military families at Fort Lewis, Wash., are suing the developer of their privatized housing alleging discrimination against disabled on-post residents.

Army Facilities Management Information Document on Mold Remediation Issues

TG 277
FEBRUARY 2002



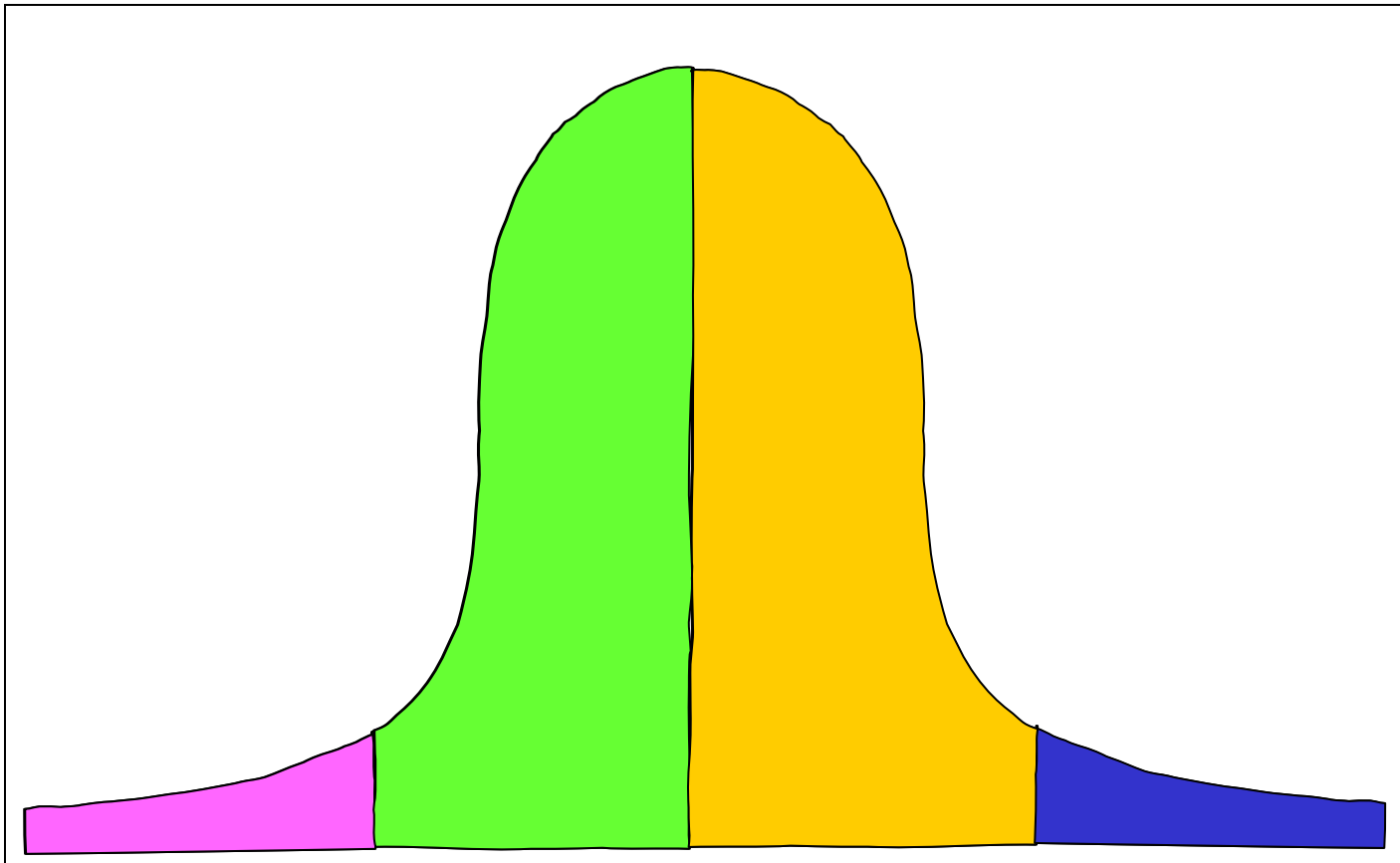
Mold Related Health Problems

- Allergy and Asthma
- Infections
- Chronic Rhinosinusitis

MOLD POPULATION

0

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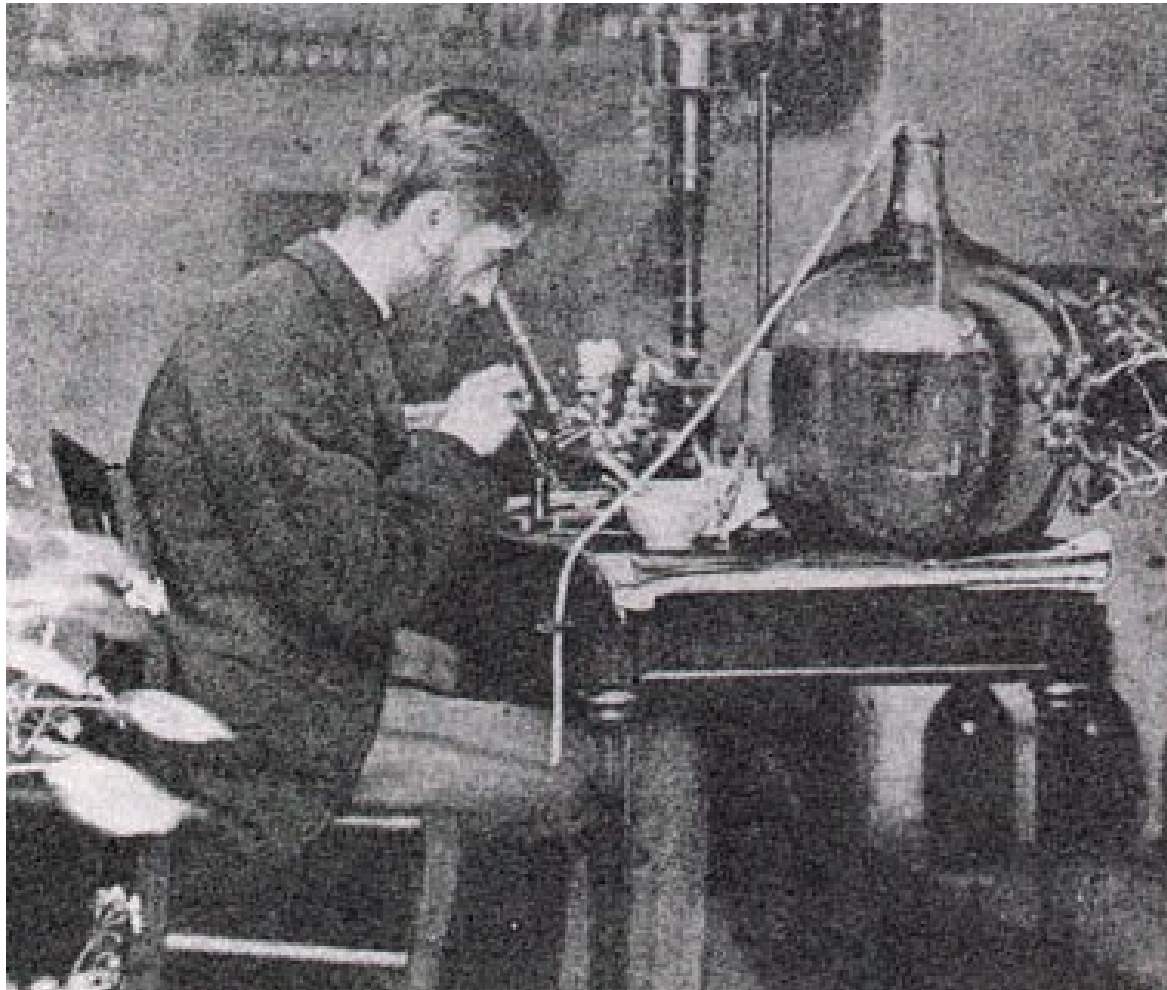


HUMAN POPULATION

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Prevention or Timely Correction

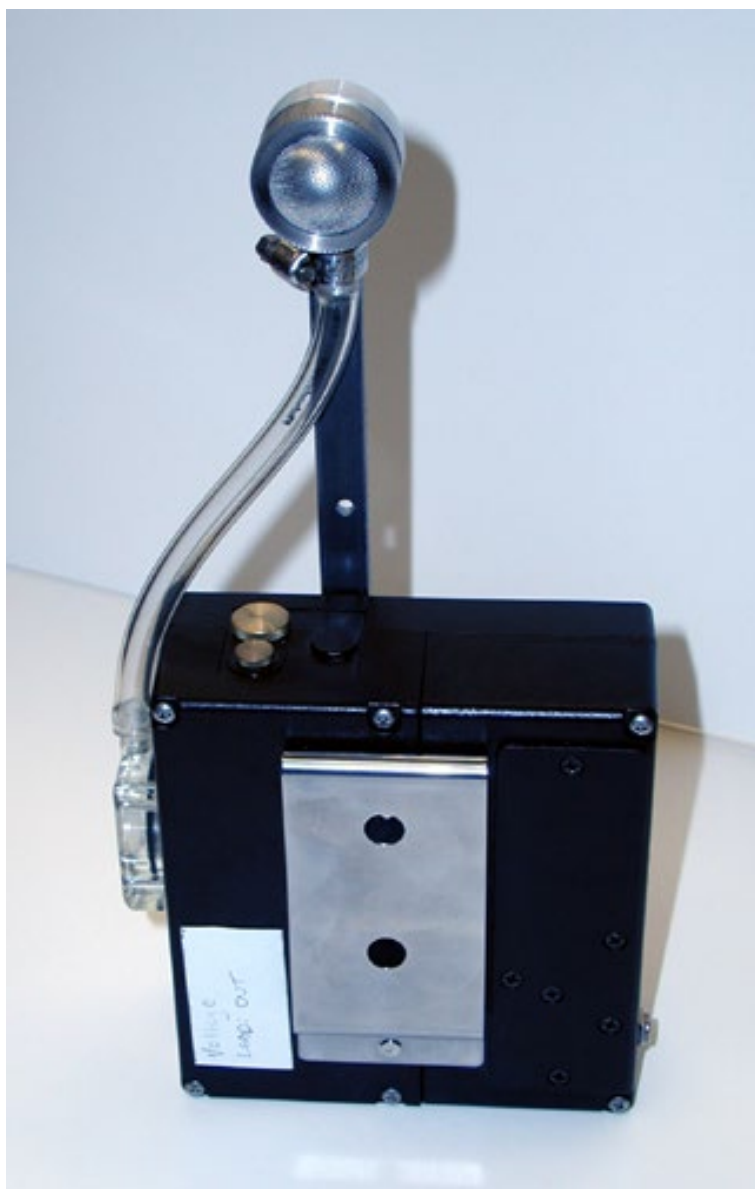


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Technology for Mold Identification and Enumeration

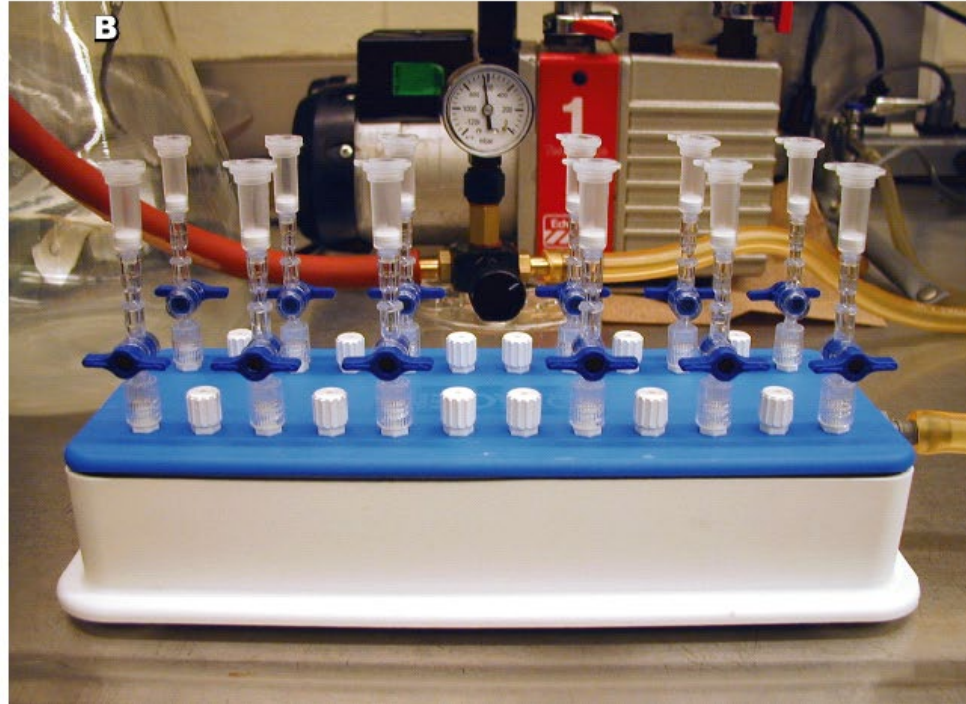
- QPCR: Based on DNA (Patent 6,387,652)



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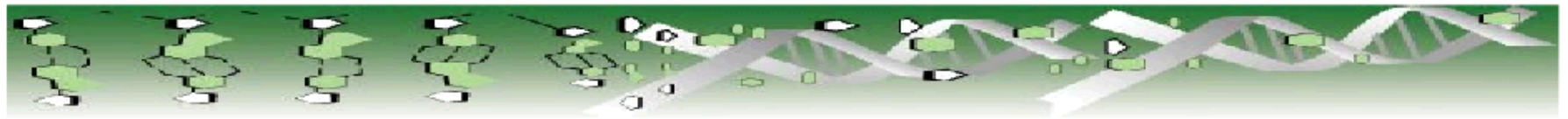
A) Photograph of mini beadbeater (Biospec Products, Bartlesville, OH). B) Photograph of QIAvac 24 (Qiagen Inc., Valencia, CA) 24-place manifold device fitted with twelve Dneasy™ silica gel membrane cartridges.





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POLYMERIZATION

Forward Primer

AfumiF1: 5' - GCCCGCCGTTTCGAC AfumiP1: 5' - CCCGCCGA'AGACCCCAACATG

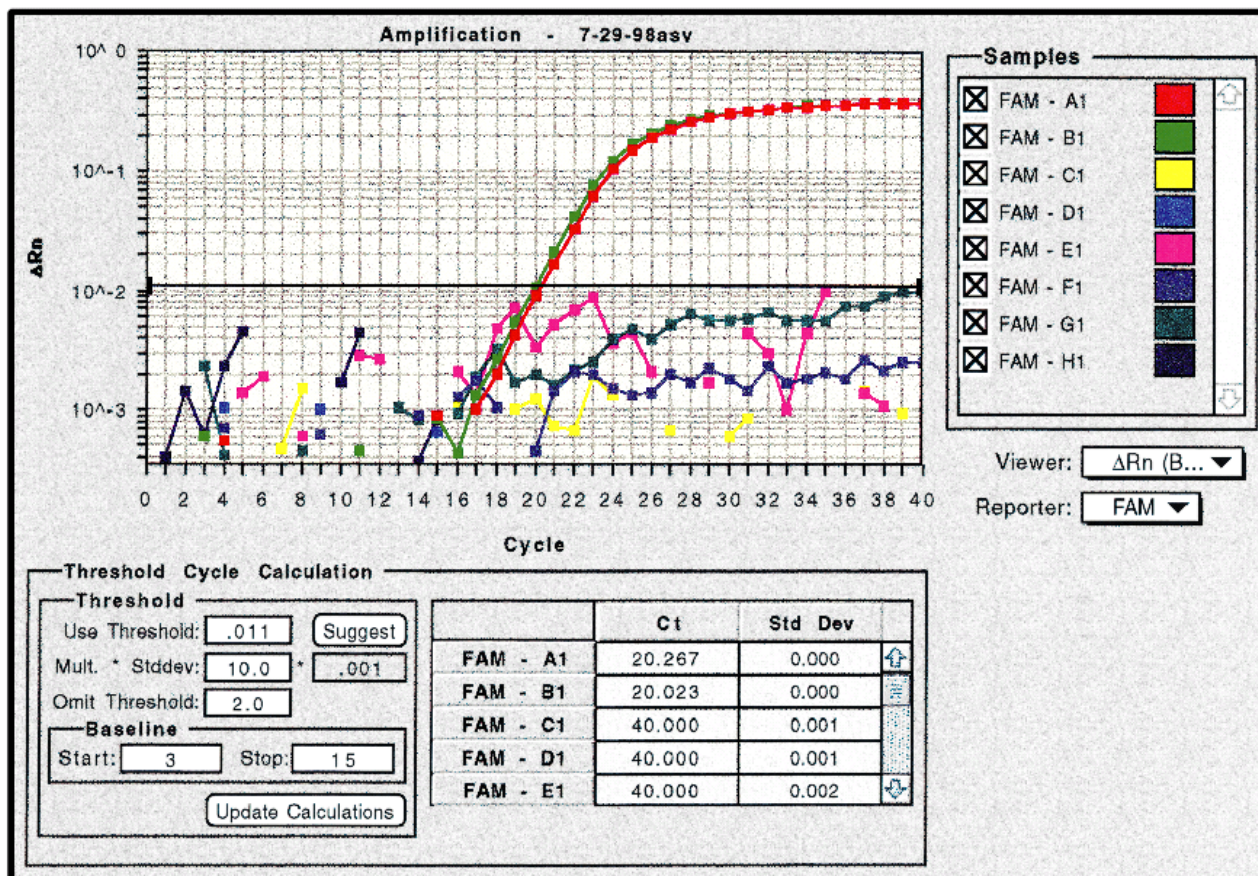
AfumiR1: 5' - CCGTTGTTGAAAGTTTAACTGATTAC

Reverse Primer

BACK



FORWARD



Representative output of ΔR_n results (Reporter minus Quencher dye fluorescence) and C_T calculations from real time TaqMan analyses performed in the Model 7700 Sequence Detector.

Absidia coerulea/glauca
Absidia corymbifera
Acremonium strictum
Alternaria alternata
Apophysomyces elegans, Saksenea vasiformis
Aspergillus auricomus
Aspergillus caespitosus
Aspergillus candidus
Aspergillus carbonarius
Aspergillus cervinus
Aspergillus clavatus/giganteus
Aspergillus flavipes
Aspergillus flavus/oryzae
Aspergillus fumigatus, Neosartorya fischeri
Aspergillus niger/foetidus/phoenicus
Aspergillus niveus
Aspergillus nomius
Aspergillus ochraceus/ostianus
Aspergillus ochraceus
Aspergillus ostianus
Aspergillus paradoxus
Aspergillus parasiticus/sojae
Aspergillus penicillioides
Aspergillus puniceus
Aspergillus restrictus/caesillus/conicus
Aspergillus sclerotiorum
Aspergillus sydowii
Aspergillus tamarii
Aspergillus terreus
Aspergillus unguis
Aspergillus ustus
Aspergillus versicolor
Aspergillus wentii
Aureobasidium pullulans
Chaetomium globosum
Cladosporium cladosporioides- Type 1
Cladosporium cladosporioides- Type 2
Cladosporium herbarum
Cladosporium sphaerospermum
Conidiobolus coronatus/incongruus
Cunninghamella elegans
Emericella nidulans/rugulosa/quadrilineata
Emericella varicolor
Eurotium amstelodami/chevalieri/herbariorum/rubrum/repens
Epicoccum nigrum

Geotrichum candidum
Geotrichum klebahnii
Memnoniella echinata
Mortierella polycephala/wolfii
Mucor mucedo
Mucor
amphibiorum/circinelloides/heimalis/indicus/mucedo/racemosus/ra
mosissimus, Rhizopus
azygosporus/homothallicus/microsporus/oligosporus/oryzae
Myrothecium verrucaria
Paecilomyces lilacinus
Paecilomyces varioti
Penicillium aethiopicum
Penicillium atramentosum
*Penicillium aurantiogriseum**
Penicillium
aurantiogriseum/tricolor/freii/polonicum/viridicatum/verrucosum/*
hirsutum
Penicillium aurantiogriseum/tricolor/freii/polonicum/viridicatum
Penicillium canescens
Penicillium citreonigrum
Penicillium coprophilum
Penicillium crustosum
Penicillium digitatum
Penicillium brevicompactum/alberechii
*Penicillium chrysogenum**
Penicillium
chrysogenum/griseofulvum/glandicola/coprophilum/expansum/aeth
iopicum, Eupenicillium crustaceum/egyptiacum
Penicillium citrinum/sartoryi/westlingi
Penicillium corylophilum
Penicillium decumbens
Penicillium echinulatum/solitum/camembertii/commune/crustosum
Penicillium expansum
Penicillium fellutanum/charlesii
Penicillium freeii
Penicillium glandicola
Penicillium griseofulvum
*Penicillium hirsutum**
Penicillium implicatum
Penicillium islandicum
Penicillium italicum
Penicillium janthinellum/raperi
Penicillium lividum

Penicillium madriti/gladioli
Penicillium melinii
Penicillium miczynskii
Penicillium olsonii
Penicillium oxalicum
Penicillium purpurogenum
Penicillium raistrickii
Penicillium restrictum
Penicillium roquefortii
Penicillium sclerotiorum
Penicillium simplicissimum/ochrochloron
Penicillium spinulosum/glabrum/thomii/pupurescens,
Eupenicillium lapidosum
Penicillium variabile
*Penicillium verrucosum**
Penicillium waksmanii

Rhizomucor meihei/pusillus/variabilis
Rhizopus stolonifer
Scopulariopsis asperula
Scopulariopsis brevicaulis/fusca
Scopulariopsis brumptii
Scopulariopsis chartarum
Scopulariopsis sphaerospora
Stachybotrys chartarum
Trichoderma asperellum/hamatum
*Trichoderma asperellum/hamatum/viride**
Trichoderma harzianum
Trichoderma longibrachiatum/citroviride
Trichoderma viride/atroviride/koningii*
Ulocladium atrum
Ulocladium chartarum
Ulocladium botrytis
Wallemia sebi



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Companies Licensed to Utilize Mold Technology

Aerotech Laboratories, Inc.

Pure Earth Lab

EMSL Analytical Inc.

Microbac Lab

Forensic Analytical

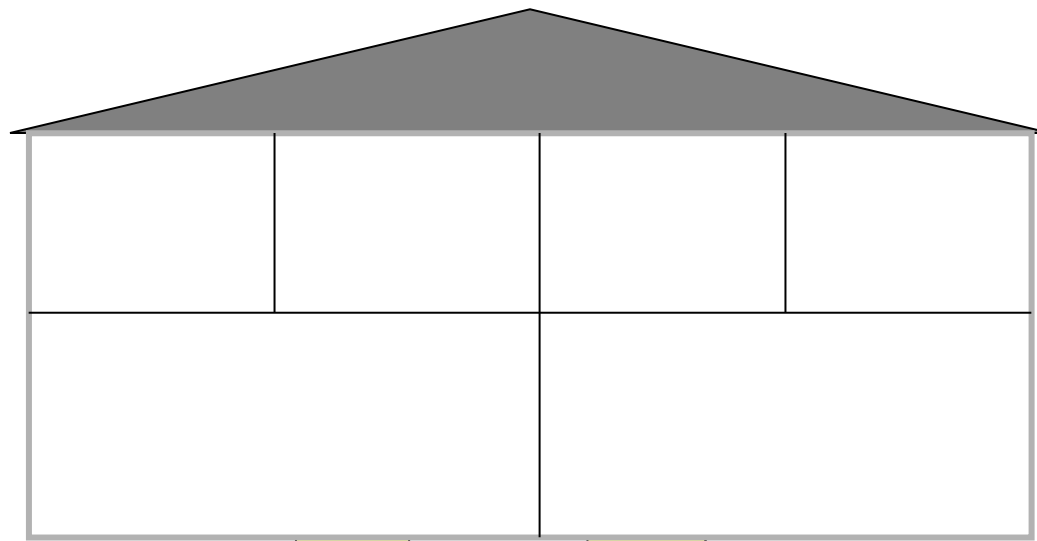
Galson Laboratories

Healthy Office Co. UK Limited

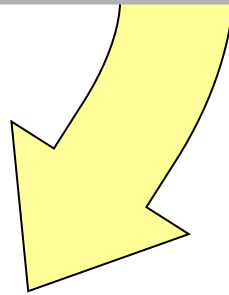
Cenas, AG

STL-P&K Laboratories

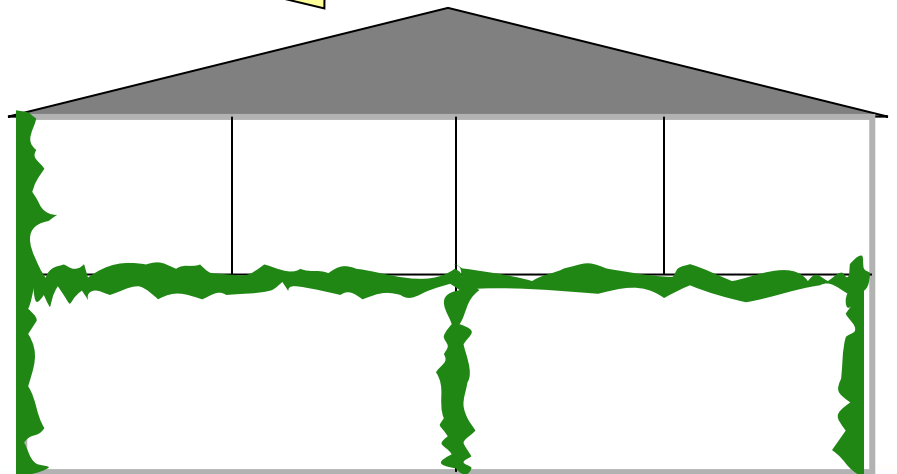
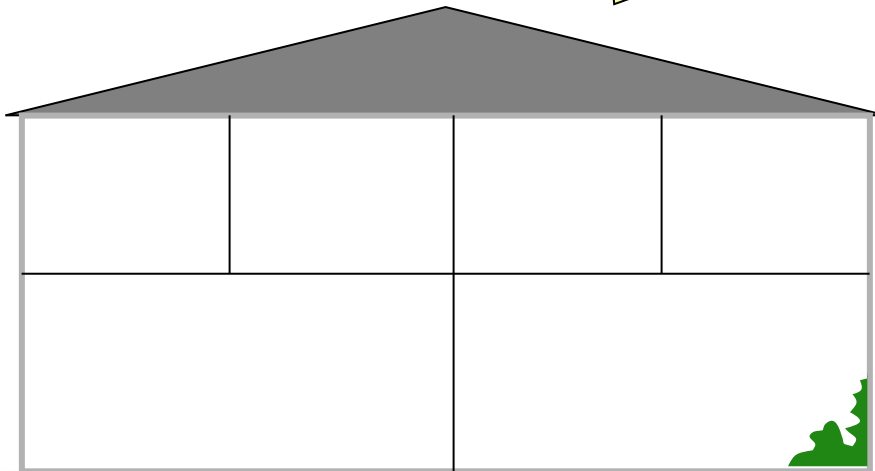
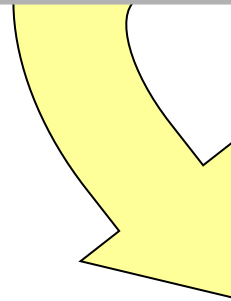
and more



Moderate



Severe



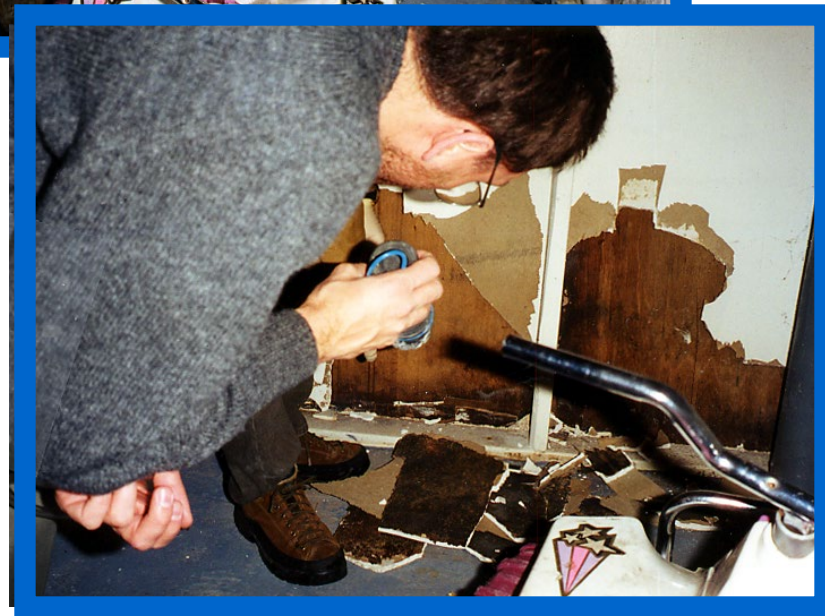
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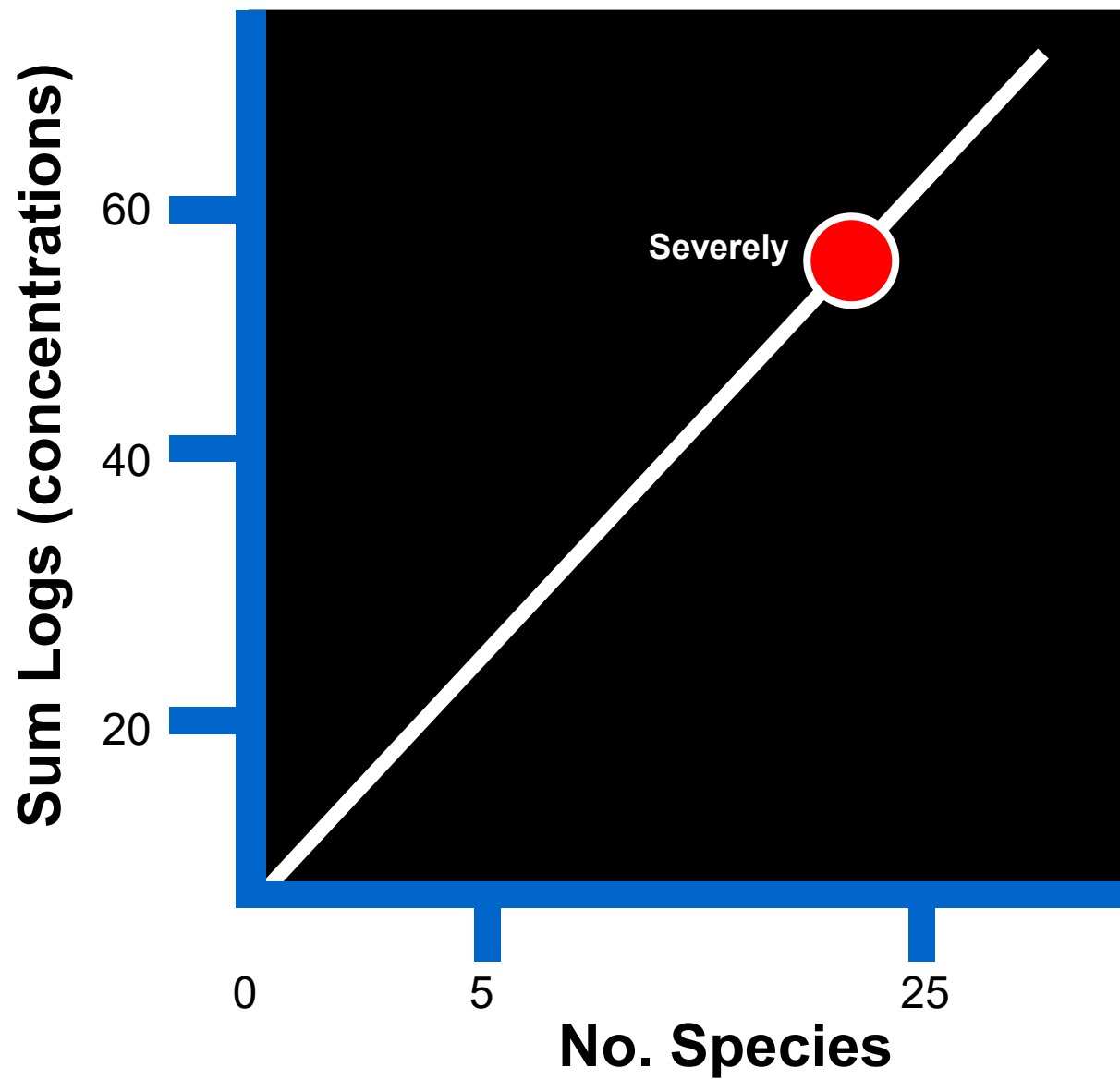
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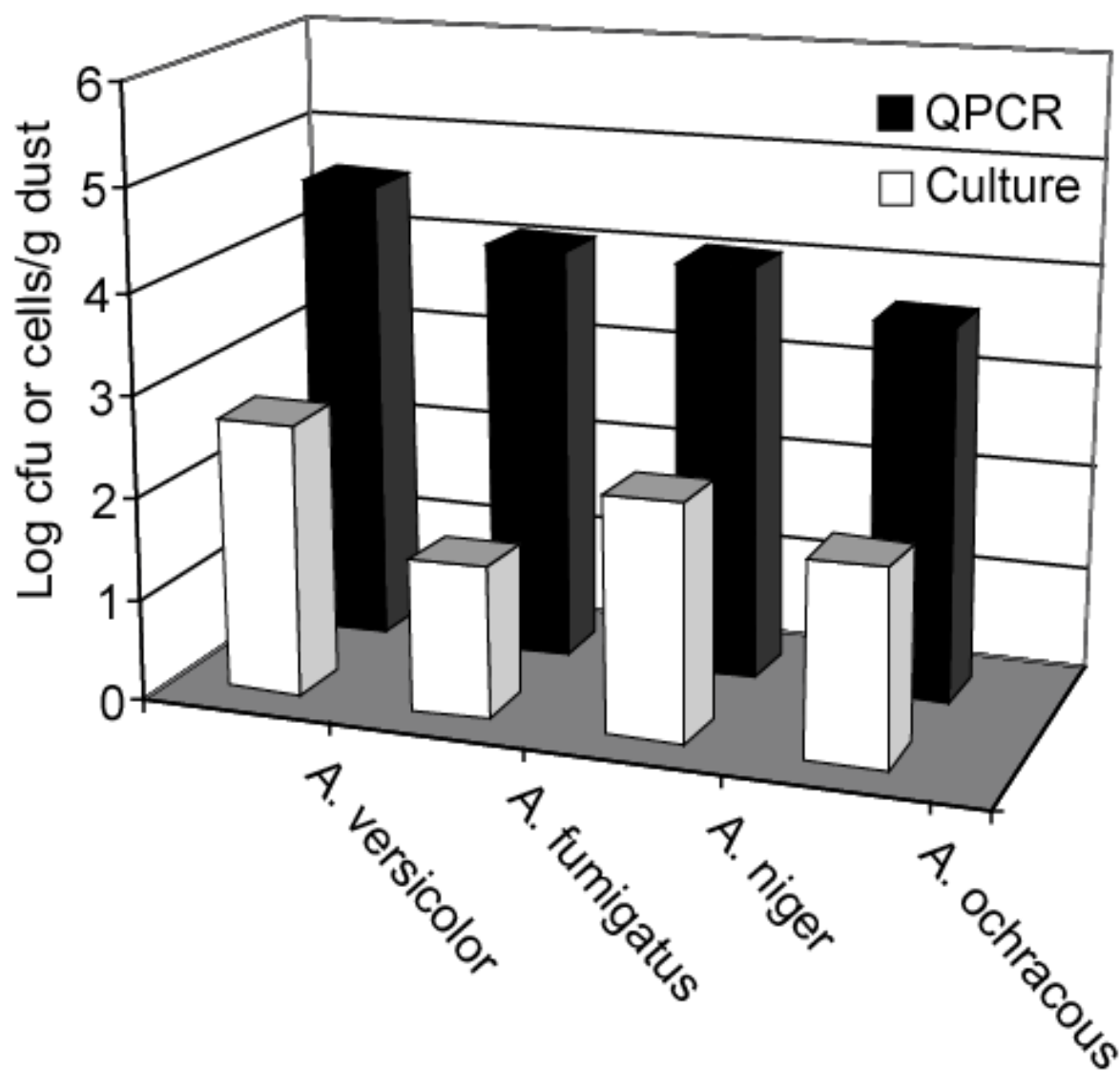
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High-Rise Alert: There's a Fungus Among Us

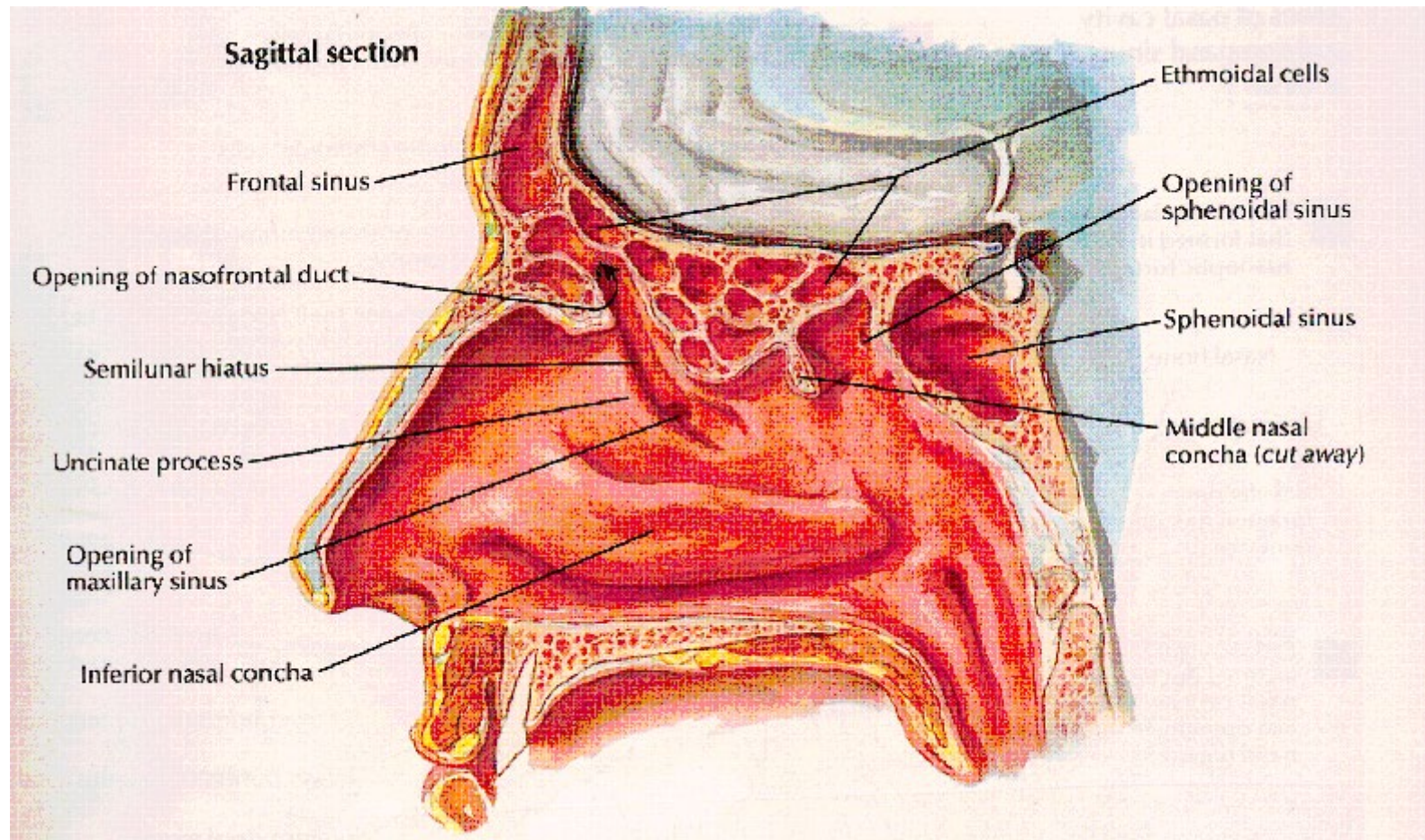


CITY LAND BY THE NEW YORK TIMES

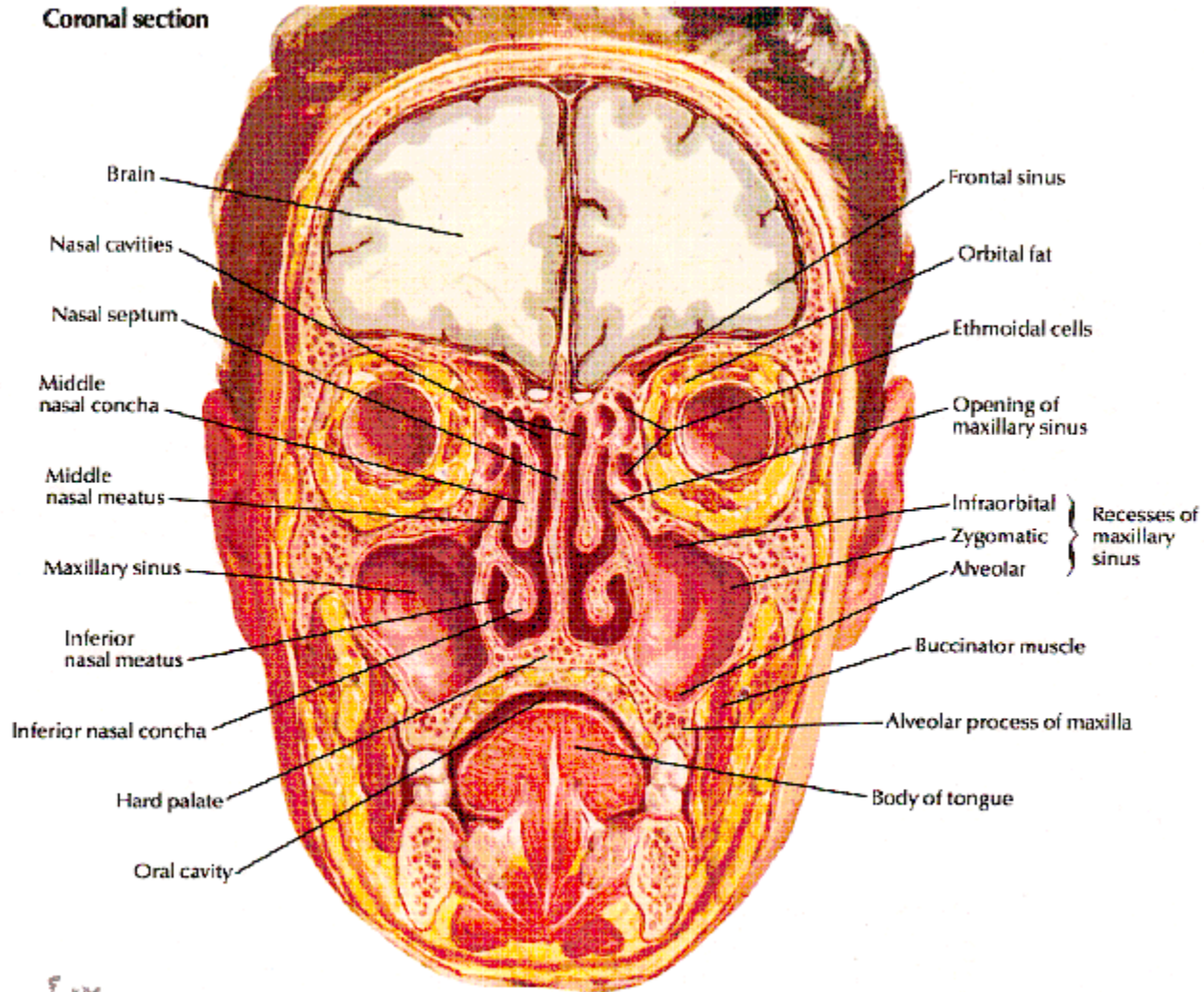
The 25-story, 453-room Kalia Tower at the Hilton Hawaiian Village in Waikiki was shut because of a persistent mold problem.

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Coronal section



F. Netter
M.D.

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Prevention

- Real Time Monitoring
 - Hospitals, especially during construction
 - Homes, especially of immunocompromised

<i>Aspergillus</i> species	Number of cells/m ³ air			
	Outdoors	Floor 1	Floor 2	Floor 3
<i>Aspergillus flavus</i>	<2	<2	4	<2
<i>Aspergillus fumigatus</i>	<2	<2	<2	<2
<i>Aspergillus niger</i>	<2	<2	980	<2
<i>Aspergillus ochraceus</i>	<2	<2	<2	<2
<i>Aspergillus sydowii</i>	<2	<2	45	<2
<i>Aspergillus ustus</i>	<2	<2	380	<2
<i>Aspergillus versicolor</i>	<2	<2	<2	<2
<i>Eurotium</i> (Asp.) spp.	<2	27	2900	<2

Aspergillus species	Average number of cells				
	Floor			Corridor carpet	
	09/04/2002 ^a N = 2	29/04/2002 ^b N = 3	21/11/2002 ^b N = 2	19/04/2002 ^a N = 1	21/11/2002 ^b N = 1
<i>Aspergillus flavus</i>	119	<1	<1	11	3
<i>Aspergillus fumigatus</i>	<1	23	<1	660	<1
<i>Aspergillus niger</i>	50	74	<1	380	<1
<i>Aspergillus ochraceus</i>	<1	<1	<1	<1	<1
<i>Aspergillus sydowii</i>	30	<1	<1	390	<1
<i>Aspergillus ustus</i>	398	117	<1	220	3
<i>Aspergillus versicolor</i>	145	158	<1	1400	<1
<i>Eurotium (Asp.) spp.</i>	1495	1517	3	19000	55

^a Reported as average number of cells per mg dust.

^b Reported as average number of cells per sample since insufficient dust was collected over the sample area. This reflected reduced dust loading after repeated HEPA vacuuming.

PUBLICATIONS

Vesper, S. J., Varma, M., Wymer, L. J., Dearborn, D. G., Sobolewski, J., Haugland, R. A. Quantitative PCR analysis of fungi in dust from homes of infants who developed idiopathic pulmonary hemorrhaging. *Journal of Occupational and Environmental Medicine*. 46:596-601. **2004**

Neely, A. N., Gallardo, V., Barth, E, Haugland, R. A., Warden, G., Vesper, S. J. Rapid monitoring by QPCR for pathogenic *Aspergillus* during carpet removal from a hospital. *Infection Control and Hospital Epidemiology*. 25:350-352. **2004**

Meklin, T., Haugland, R.A., Reponen, T., Varma, M., Lummus, Z., Bernstein, D., Wymer, L. J. Vesper, S. J. Quantitative PCR analysis of house dust can reveal abnormal mold conditions. *Journal of Environmental Monitoring*. 6:615-620. **2004**.

Morrison, J., Yang, C., Lin, K.-T., Haugland, R.A., Neely, A. N., Vesper, S. J. Monitoring *Aspergillus* species by quantitative PCR during construction of a multi-story hospital building. *Journal of Hospital Infection*. 57:85-87. **2004**.

PUBLICATIONS

Haugland, R. A., Varma, M., Wymer, L. J., Vesper, S. J. Quantitative PCR of Selected *Aspergillus*, *Penicillium* and *Paecilomyces* Species. Systematic and Applied Microbiology. 27:198-210. **2004**

Brinkman, N. E., Haugland, R. A., Wymer, L. J., Byappanahalli, M., Whitman, R. L., Vesper, S. J. Evaluation of a Rapid, Quantitative Real-Time PCR Method for Cellular Enumeration of Pathogenic *Candida* Species in Water. Applied and Environmental Microbiology. 69:1775-1782. **2003**

Haugland, R. A., Brinkman, N., Vesper, S. J. Evaluation of rapid DNA extraction methods for the quantitative detection of fungal cells using real time PCR analysis. Journal of Microbiological Methods. 50:319-323. **2002**

Roe, J. D, Haugland, R. A., Vesper, S. J., Wymer, L. J. Quantification of *Stachybotrys chartarum* Conidia in Indoor Dust Using Real Time, Fluorescent Probe-based Detection of PCR Products. Journal of Exposure Analysis and Environmental Epidemiology. 11:1-9. **2001**